

REMARKS

Claims 5-9 are in the case. Claims 5 and 9 have been amended to recite that the fluidized bed reactor does not comprise a fixed catalyst bed, and that all of the characteristics of the present invention as recited in those claims apply only to a fluidized bed reactor. Support for the amendments to claims 5 and 9 can be found throughout the disclosure of the invention, *e.g.*, in the Specification on page 1, lines 1-9; and page 4, lines 18-26 and 30-35. Therefore no new matter has been added.

Claim Rejections Under 35 U.S.C. § 102(b)

The Examiner has maintained rejection of claims 5-6 and 8-9 under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 4,470,931 to Callahan *et al.* Applicants respectfully traverse based on the claims after entry of the above amendments and the following remarks.

The Office Action states that “the instant claims does not exclude the use of a fixed catalyst bed layer as Callahan *et al.* disclose,” and that the limitations of instant claims 5 and 9 “have been interpreted as being a **(1) a fixed catalyst bed and (2) fluidized catalyst bed.**” (Office Action, p. 4) (emphasis in original). Solely to expedite allowance of the claims, claims 5 and 9 have been amended to recite a fluidized catalyst bed wherein the fluidized bed reactor does not comprise a fixed catalyst bed.

In order to anticipate the present invention, a reference must disclose each and every element of the claimed invention. *Constant v. Advanced Micro-Devices Inc.*, 848 F.2d 1560, 1570 (Fed. Cir. 1988); *Minnesota Mining and Mfg. v. Johnson and Johnson Orthopedics Inc.*, 976 F.2d 1559 (Fed. Cir. 1992). Here, the primary feature of the apparatus of Callahan *et al.* is that it comprises a reactor having a combination of fixed-bed and fluid-bed catalysts. (*See, e.g.*, Callahan *et al.*, col. 6 lines 13-17 (claim 1), and the Figure). Claims

5 and 9 of the present invention have been amended to recite a fluidized catalyst bed for reacting ammonia and hydrocarbons therein; a dilute phase of the catalyst bed disposed above the fluidized catalyst bed; a set of internals introduced into space above the fluidized catalyst bed layer and disposed at least partially within the dilute phase of the fluidized catalyst bed, wherein the fluidized bed reactor does not comprise a fixed catalyst bed; and the step of removing the unreacted ammonia from the effluent of the fluidized catalyst bed by passing the effluent through the set of internals. (See claims 5 and 9). Claim 5 as amended additionally recites an inlet of a first-stage cyclone separator disposed above the set of internals, wherein the fluidized bed reactor does not comprise fixed catalyst bed. (See claim 5). Callahan *et al.*

Therefore, because there are differences between the disclosure of Callahan *et al.* and the present invention, namely, the absence of a fixed catalyst bed in the present invention, and the application of all of the limitations of claims 5 and 9 to a fluidized catalyst bed only, applicants respectfully submit that claims 5 and the claims dependent therefrom, and claim 9 are not anticipated by Callahan *et al.* under 35 U.S.C. § 102(b).

For at least these reasons, applicants respectfully submit that the rejection of claims 5-6 and 8-9 under 35 U.S.C. § 102(b) has been overcome, and respectfully request that it be reconsidered and withdrawn.

Claim Rejections Under 35 U.S.C. § 103(a)

The Examiner has maintained the rejection of claim 7 under 35 U.S.C. § 103(a) as being obvious over Callahan *et al.*

In order to establish a *prima facie* case of obviousness, three elements must be shown: (1) a particular reference (or combined references) must suggest or teach all the limitations of the challenged claim; (2) there must be a suggestion or motivation from the

prior art to modify or combine the reference teachings; and (3) a reasonable expectation of success must exist from the prior art. MPEP § 2142, citing *In re Vaeck*, 947 F.2d 488 (Fed. Cir. 1991). Finally, care must be exercised not to use the applicant's disclosure to fill in the gaps of the prior art. *In re Vaeck*, 947 F.2d 488 (Fed. Cir. 1991) citing *In re Dow Chemical Co.*, 837 F.2d 469, 473 (Fed. Cir. 1988).

Here, Callahan *et al.* do not teach or suggest all of the limitations of claim 7. Callahan *et al.* teach an apparatus for conducting a gas phase catalytic reaction comprising a fluid-bed reactor having both fluid-bed and fixed-bed catalysts. The presence of both types of catalysts is "[c]entral to the [present] invention." (See Callahan *et al.*, col. 2 lines 20-21). In contrast, the present invention, as claimed in independent claims 5 and 9 and the claims dependent therefrom, is directed to a fluidized-bed reactor that does not comprise a fixed catalyst bed.

Further, the Office Action acknowledges that "Callahan et al. fail to disclose 'a bottom side of the set of internals is at a depth within the catalyst depth of not greater than 20% of the total height of the catalyst bed.'" The present inventors discovered that the unique properties of the present invention as claimed are achieved by, *e.g.*, positioning the internals so that a bottom side of the set of internals is at a depth within the catalyst bed of not greater than 20% of the total height of the catalyst bed. (See Specification, page 4, lines 30-35). This characteristic is one of the characteristics in the present invention that allow it to achieve its unique and unexpected properties, among them extremely high degrees of acrylonitrile selectivity and ammonia conversion. (See, *e.g.* Examples 1-5). These superior and unexpected results would not have been achieved by one of ordinary skill in the prior art upon viewing Callahan *et al.*, because there is no disclosure therein of a relationship between the fluidized bed height and the position of the internals, nor is there any suggestion that this parameter, if adjusted, would lead to the superior results achieved by the present invention.

Additionally, there is no suggestion or motivation from the prior art to modify the teachings of Callahan *et al.* to arrive at the present invention. Contrary to the assertion in the Office Action, this relationship between the fluidized bed height and the position of the internals is not something that would have been obvious to one of ordinary skill in the art to have been determined by experimentation. (See Office Action, p. 3). Primarily, there is nothing in Callahan *et al.* to suggest that varying this parameter of the apparatus taught by Callahan *et al.* would yield the superior results for, *e.g.*, acrylonitrile selectivity and ammonia conversion. "Obvious to try" is not the standard under § 103. A mere obvious to try is not enough to establish *prima facie* case of obviousness; there must be a reasonable expectation of success. *Amgen, Inc. v. Chugai Pharmaceutical Co. Ltd.*, 927 F.2d 1200 (Fed. Cir. 1991). Callahan *et al.* teach that there are certain disadvantages associated with fluidized-bed catalysts alone, not in the presence of fixed-bed catalysts, *e.g.*, a necessarily increased reactor size, bubble formation, and difficulty in grading the catalyst due to a high degree of mixing (See Callahan *et al.*, column 1, lines 42-52). Callahan *et al.* go on to say that it is because of the various disadvantages of each of the types of catalysts alone that a fixed-bed in combination with the fluidized-bed is necessary. (See *id.*, column 1, lines 64-67). Therefore, it is clear that one of ordinary skill in the art viewing Callahan *et al.* would not be motivated to modify its teachings by removing the fixed-bed catalyst; this would be directly contrary to the teachings of Callahan *et al.*

Further, there is no reasonable expectation of success in modifying the teachings of Callahan *et al.* to arrive at the presently-claimed invention, as recited in claim 7. This is because Callahan *et al.* clearly state that reactors employing only fluidized beds are disadvantageous, as discussed above. Callahan *et al.* emphasize repeatedly that fixed-bed catalysts and fluid-bed catalysts each alone have various disadvantages (*see* Callahan *et al.*, column 1, lines 24-52) but that in combination, the advantages of each can be achieved while

the disadvantages are minimized. For example, Callahan *et al.* state that beneficial results can be achieved by allowing the fluid-bed particles to move through the fixed bed. (*See id.*, column 1, line 64 to column 2, line 27). Thus, Callahan *et al.* teach away from the present invention. One of ordinary skill in the art, even if motivated to modify the teachings of Callahan *et al.*, still would not do so because there would be no reasonable expectation of success.

For at least the above reasons, applicants respectfully submit that claim 7 is not obvious in light of Callahan *et al.*, and that the rejection under 35 U.S.C. § 103(a) has therefore been overcome.

CONCLUSION

For the foregoing reasons, applicants respectfully submit that the application is now in condition for allowance, early notice of which is earnestly sought.

No fee, other than the fee for extension of time, is believed to be due for the submission of this Response. However, should any additional fee be required, please charge such fee to Deposit Account No. 16-1150.

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Appendix A

Application No.: 09/440,277

Attorney Docket No.: 008031-0007-999

Marked up Version of The Amendments to The Claims

(with insertion and deletion indicated in bold-face underlining and brackets respectively)

5. (Amended) A process for removing unreacted ammonia from an effluent of a catalyst bed used in **[a hydrocarbon ammoxidation reaction]** ammoxidation of hydrocarbons, comprising the steps of:

(a) providing a fluidized bed reactor, said reactor comprising:

(1) a catalyst bed for reacting ammonia and hydrocarbons

therein;

(2) a dilute phase of the catalyst bed disposed above the

catalyst bed;

(3) a set of internals disposed at least partially within the

dilute phase of the catalyst bed;

(4) an inlet of a first-stage cyclone separator disposed above

the set of internals; and

(b) removing the unreacted ammonia from the effluent of the

catalyst bed by passing the effluent through the set of internals, wherein the

ammonia and hydrocarbons present in the effluent contact the dilute phase of the

catalyst bed and react herein.

9. (Amended) A process for removing unreacted ammonia from an effluent of a catalyst bed used in **[a hydrocarbon ammoxidation reaction]** **ammoxidation of hydrocarbons**, comprising the steps of:

(a) providing a fluidized bed reactor, said reactor comprising:

(1) a catalyst bed for reacting ammonia and hydrocarbons therein;

(2) a dilute phase of the catalyst bed disposed above the catalyst bed;

(3) a set of internals disposed at least partially within the dilute phase of the catalyst bed; and

(b) removing the unreacted ammonia from the effluent of the catalyst bed by passing the effluent through the set of internals, wherein the ammonia and hydrocarbons present in the effluent contact the dilute phase of the catalyst bed and react therein.

Appendix B

Application No.: 09/440,277

Attorney Docket No.: 008031-0007-999

A Complete Set of All The Pending Claims

5. A process for removing unreacted ammonia from an effluent of a catalyst bed used in ammoxidation of hydrocarbons, comprising the steps of:

(a) providing a fluidized bed reactor, said reactor comprising:

(1) a catalyst bed for reacting ammonia and hydrocarbons

therein;

(2) a dilute phase of the catalyst bed disposed above the

catalyst bed;

(3) a set of internals disposed at least partially within the

dilute phase of the catalyst bed;

(4) an inlet of a first-stage cyclone separator disposed above

the set of internals; and

(b) removing the unreacted ammonia from the effluent of the

catalyst bed by passing the effluent through the set of internals, wherein the

ammonia and hydrocarbons present in the effluent contact the dilute phase of the

catalyst bed and react herein.

6. The process according to claim 5, wherein the set of internals are selected from the group consisting of packing, baffles, screens and combinations thereof.

7. The process according to claim 5, wherein a bottom side of the set of internals is at a depth within the catalyst bed of not greater than 20% of the total height of the catalyst bed.

8. The process according to claim 5, wherein the hydrocarbons are of a compound selected from the group consisting of propane, propylene, isobutene, xylene and combinations thereof.

9. A process for removing unreacted ammonia from an effluent of a catalyst bed used in ammoxidation of hydrocarbons, comprising the steps of:

(a) providing a fluidized bed reactor, said reactor comprising:

(1) a catalyst bed for reacting ammonia and hydrocarbons therein;

(2) a dilute phase of the catalyst bed disposed above the catalyst bed;

(3) a set of internals disposed at least partially within the dilute phase of the catalyst bed; and

(b) removing the unreacted ammonia from the effluent of the catalyst bed by passing the effluent through the set of internals, wherein the ammonia and hydrocarbons present in the effluent contact the dilute phase of the catalyst bed and react therein.